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IRON AGE

THE MANAGEMENT MAGAZINE FOR METAL PRODUCERS

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AUGUST 1988

THE NEW AGE OF IRONMAKING

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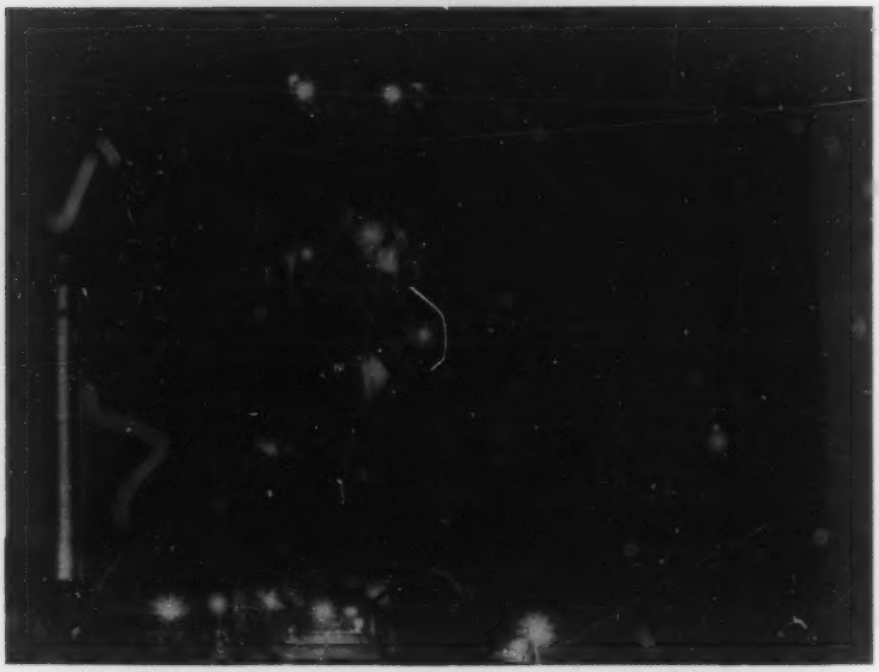
AUGUST 1988



Wheeling-Pittsburgh's No. 5 blast furnace lights up the morning sky at Mingo Junction.

The New Age of Ironmaking

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Now, they're talking about endless campaigns.—*P.22*

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Truck deregulation hits a Congressional roadblock

(FNS)--A 160-member coalition, including several metals industry firms, having so far failed to persuade key congressmen to consider truck deregulation, has kicked off a grassroots consumer campaign to turn up the political heat on the reluctant lawmakers.

At stake is hardly some abstract truck law. "If the U.S. is to be competitive against foreign nations it must be competitive at home, first," said Matt Scocozza, the U.S. Department of Transportation's (DOT) assistant secretary.

"Whether we're talking about steel, other heavy industries, or food, we have the chance to give our manufacturers an advantage against foreign producers," Mr. Scocozza told reporters at a news conference held by Americans for Safe and Competitive Trucking.

"Right now," he said, "when foreign-produced goods, such as steel, are imported they average two truck shipments before reaching their ultimate consumer. Often the same product, made domestically, must move six or seven times."

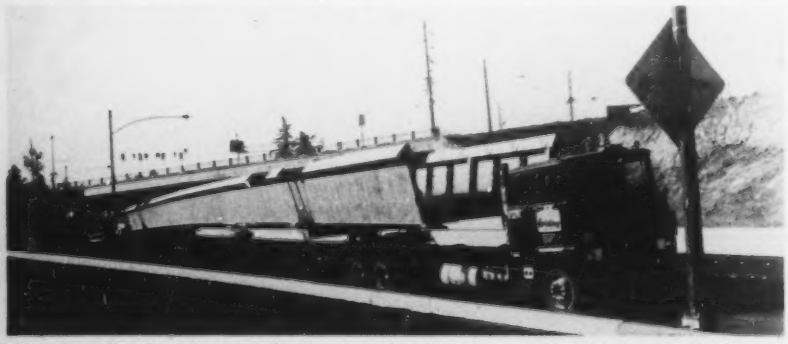
Each freight movement tacks on extra costs to the product given the peculiarities of existing truck laws. In most cases, motor carrier companies can collude to set prices on long-distance shipments, as if two major steel companies were to meet to decide the price of their plate products. With every shipment, tariffs, or freight prices, must be filed with the U.S. Interstate Commerce Commission, although the agency no longer has authority to veto these rates, under provisions of the 1980 Motor Carrier Act.

While this law largely deregulated the trucking industry, reportedly saving about $60 billion annually, it left intact various onerous provisions, such as price-fixing antitrust immunity. It also permitted states to continue to regulate trucking. Consequently, states with a significant metal industry concentration, such as Texas, California, Pennsylvania and several in the Midwest, have imposed their own truck regulations.

Overall, the combination of such laws in 42 states and the vestiges of regulations not eliminated by the 1980 law, cost businesses about $30 billion annually, according to Con Hitchcock, an attorney with Public Citizen, a consumer group and coalition member.

To ameliorate this situation, the group is urging Congress to take up identical House and Senate bills (H.R. 2591 and S. 1710), that would eliminate all truck regulations, save for those relating to safety and insurance. They also would preempt state regulations.

However, Mr. Scocozza acknowledged that business and the Reagan Administration, which favors these bills, have run into a wall in seeking congressional action. Sen. Ernest Hollings (D-S.C.), the Senate Commerce Committee chairman, has declined to hold hearings on the bills and the committee's House counterpart will not act until Sen. Hollings does.



Steel and other industries carry the burden of trucking regulations.

USX selling rail and shipping operations to investment group

A new company is acquiring the transportation businesses of USX Corp.

Owned by Blackstone Capital Partners, the new company will be paying over $500 million for a system that includes 20,000 rail cars, 14 lake vessels, 305 barges and 27 tugboats. Headquarters will be near Pittsburgh.

The Blackstone Group was founded in 1985 by Peter G. Peterson, its chairman, and Stephen A. Schwarzman, its president. Mr. Peterson was formerly Secretary of Commerce.

In addition to Mr. Peterson and Mr. Schwarzman, the six general partners include David A. Stockman, former director of the Office of Management and Budget, and Roger C. Altman, former Assistant Secretary of the Treasury.

The sale ties in with the recent USX policy of divesting steel related assets and using the proceeds for diversification.

The latest transaction is a little surprising, however, because in the last year or so, steel companies have been having second thoughts about getting away from full integration. It is of interest that the prestigious Blackstone Group is attracted to a steel-based transportation network.

Correction

The first quarter earnings and sales of New Jersey Steel Corp. were incorrectly shown in metal industry sales/earnings table that appeared in the June issue of *Iron Age*.

The correct figures for the first quarter of 1988 were: Earnings, $3.9 million; sales, $25.2 million; earnings as a pct of sales, 15.5 pct; earnings increase over the first quarter of 1987, 144 pct. Sales were up 37 pct from the first quarter of 1987. In the first quarter of 1987, New Jersey Steel had a profit of $1.6 million and sales of $18.4 million.

Iron Age sincerely regrets the error.

BLAST FURNACES: MORE HEAT FROM THE HOT END

The steel industry is relining or rebuilding close to 40 pct of its active furnaces this year, with the hope of pumping more metal from its big ironmakers.

By the end of the 12-month period that began Jan. 1, 1988, some 20 blast furnaces in the U.S. and Canada will have been shut down for relining.

This adds up to an enormous outage. Close to 40 pct of the active U.S. blast furnaces will have been down at one time or another in 1988.

In the old days, standby furnaces would have filled in during the repairs. That standby capacity is supposedly gone, washed away by the cutbacks of the last six years.

All of which raises the question: Can North American steel mills pump enough iron to keep up with continued strong demand? It looks as though the mills will squeak by, but the next six months will provide a severe challenge for operators. According to one estimate, the relines will reduce steel output by 1.5 million tons in the second half.

Inland No. 7

The big No. 7 blast furnace of Inland Steel was shut down on Aug. 5, 1987 for relining. For every day the furnace was out of service, Inland lost 7,500 tons of badly needed iron.

Not surprisingly, the relining was done on a crash basis. Between 600 and 1,000 men and women worked two 10-hour shifts a day. The whole furnace, including the hearth, was relined. The middle section of the shell was replaced and the cooling system was improved.

The whole job was completed on Nov. 10, sixteen days ahead of schedule. The $30 million cost was $2.8 million under budget. The output of No. 7 after the construction was up to 9,000 tons a day.

These accomplishments were preceded by another crash program. This was initiated when Inland abandoned its original plan to reline portions of the No. 7 furnace with the Hoogovens system of graphite and cooling plates.

"Due to financial constraints, we opted to go to a more conventional lining," said Peter Whelan, a research engineer specializing in refractories. "Our engineering department asked us to come up with a conventional material that would be superior to the original lining."

The refractories originally used into the lower stack of No. 7 had been unsatisfactory. "For the last four and a half years," said Mr. Whelan, "we were grouting on a continual basis because there was no refractory left in the lower stack.

"We knew that our basic failure mechanism was thermal shock," he said. "A lot of times alkali attack will influence a campaign. Abrasion is a factor. But our predominant destructive mechanism was thermal shock."

To check the shock resistance of different grades, Inland tried conventional tests first and then devised its own method. "It involved placing the refractory specimen in a 2,600°F atmosphere, holding it for 30 minutes, and placing one-half the specimen in water," said Mr. Whelan. "This caused a severe stress at the water line."

The shock treatment was tried on 70 to 80 aluminum silicate refractories from 40 to 50 suppliers. "Eighty-five to 90 pct of the specimens turned into rubble after just one application," said Mr. Whelan. "We did run into a series of refractories from several manufacturers that were able to withstand this shock test repeatedly."

It turned out that best results came from a refractory that was down the grade scale rather than up. "Believe it or not, this was a 50 pct alumina," said Mr. Whelan. "It is a semi-andalusite refractory."

Within this general area, Inland narrowed its candidates down to two specific grades. "Once we got

down to either A or B, we did pretty severe alkali tests," said Mr. Whelan. "B totally vaporized in the alkali."

The other grade was impervious to alkali attack, and there was no difficulty making the final selection. "We pretty well knew which manufacturer (A.P. Green) we were working with," said Mr. Whelan. "There were some refinements made with grain sizing. The kiln setting was critical, too. If you overburn a refractory, you make it weak."

The testing and the refinements were completed in time for the reline of No. 7 furnace. "We came up with quite a viable product and it cost us less than the original lining in 1980," said Mr. Whelan.

On the big furnace, the new grade was used in the lower stack. "We're currently relining our No. 6 blast furnace," said Mr. Whelan. "The same refractory is being used. It's not just being used in the lower stack. It's being carried down to the carbon sidewalls."

He feels the new refractory will bring significant benefits to blast furnaces throughout the world.

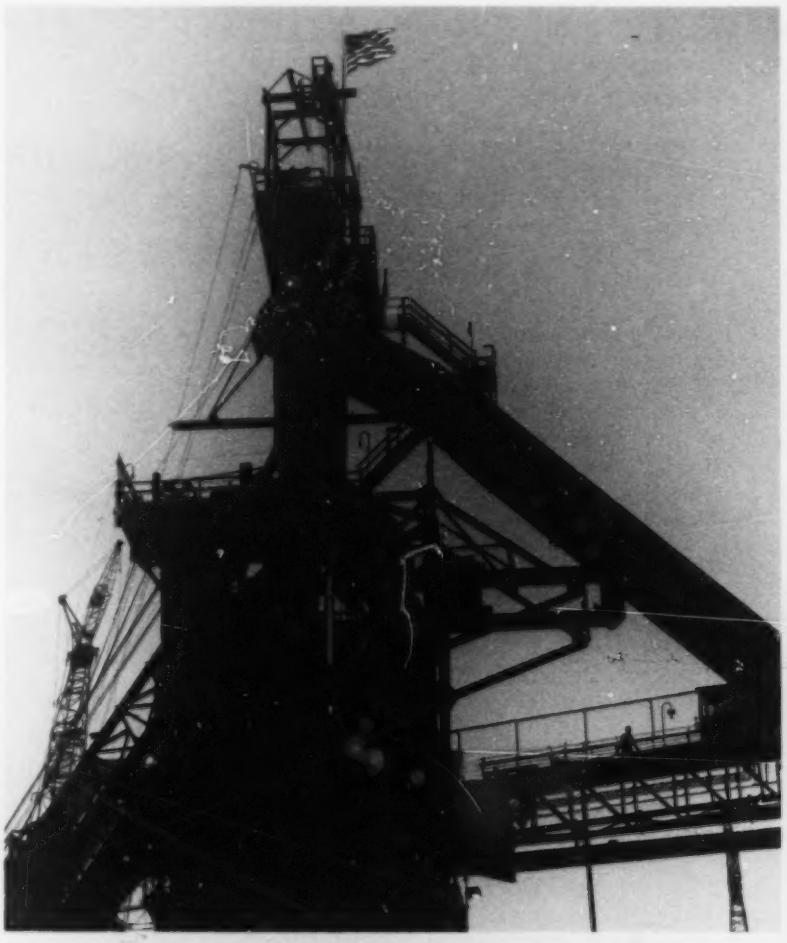
Endless Campaigns

With demand strong, most plants face the difficulty of relining and repairing blast furnaces without suffering excessive production losses.

This is a special problem for the Lake Erie Works of Stelco because the plant has only one blast furnace. "We planned to reline the furnace after a 10-year campaign," said R.N. Hill, division superintendent of operations at the Lake Erie Works. "The plan called for the second furnace to be in place."

The plan was altered by the market downturn, and the second furnace was never built. Accordingly, Stelco isn't waiting 10 years until a major rebuild requires a long outage. The company will avoid a big shutdown by making a series of interim repairs.

"Every four years—sometimes three years—we go down and repair a piece of the furnace," said Mr. Hill. "Our plan is to maintain



Armco installed a new top on its No. 3 furnace at Middletown (above) in order to run higher pressures in the furnace. Dofasco's rebuilding of its No. 4 blast furnace included extensive use of graphitic refractories and Hoogovens cooling plates.

everything external to the furnace shell between these interim repairs. Stove valves, gas cleaning, the Paul Wurth top we can repair during normal maintenance."

One interim repair was scheduled for the summer of 1988, after eight years and 9 million metric tons of what had been planned as a 10-year campaign.

"Iron to iron, we'll be down 33 days," said Mr. Hill in late June. "The current repair will consist of replacing four rows of staves. We're going to replace the hearth walls, the tuyere breast, and we're going to rebrick the bosh. We may do some gunning in the upper stack. We hope we don't have to.

"We're going to replace the Paul Wurth top," he added. "That's a preventive thing; the top isn't in any distress." All the refractory replacements will be in-kind.

The Lake Erie plant has been able to accumulate enough slabs to run its strip mill for two weeks of the blast furnace shutdown.

Middletown No. 3

In October 1984, the No. 3 furnace of Armco's Middletown plant began operating after an extensive rebuilding project. The furnace was the first in North America to make full use of the Hoogovens graphite lining.

"It's a combination of graphite and semi-graphite," said John Duncan, superintendent of the No. 3 furnace. "The graphite is located in contact with the cooling plates. The semi-graphite is in between.

"The graphite and semi-graphite go all the way up the bosh to just beneath the flair of the furnace," said Mr. Duncan. (There is carbon in the tuyere jacket.)

"We chose to put silicon carbide on the hot face in the mid-stack and continued that up the stack until we reached an elevation 15 ft below the large bell," he said. "That was an Armco decision. We chose to go to silicon carbide. That seems to be beneficial."

Productivity of No. 3 furnaces has steadily increased since the rebuilding. "For the month of May, that furnace averaged 8.16 tons per 100 cu ft of working volume,"

How North American Blast Furnaces Stack Up...

Company and Location	Furnace Number /Name	Hearth Diam. (ft/in.)	Working Volume (Mcf)	Yearly Production (Net Tons)	Reline Date
Acme Steel					
Chicago, Ill.	A	25'3"	41.4	876,000	1/85
	B	19'8"	27.0	438,000	Idle
Algoma Steel					
Sault Ste. Marie, Ont.	4	17'3"	17.0	400,000	1992
	6	27'0"	45.6	950,000	1989
	7	35'0"	88.2	1,800,000	1988
Armco					
Ashland, Ky.	Amanda	33'5"	70.5	1,277,500	1989
	Bellefonte	28'9"	50.7	912,500	1988
Middletown, Ohio	1	18'6"	22.9	440,000	–
	3	29'6"	52.4	1,405,000	–
Bethlehem Steel					
Bethlehem, Pa.	B	30'0"	–	–	–
	C	27'11"	49.7	1,095,000	Banked
	D	30'0"	54.9	949,000	–
	E	24'0"	–	–	Idle
Burns Harbor, Ind.	C	38'3"	88.8	2,618,875	1988
	D	35'0"	88.7	2,498,425	1991
Sparrows Point, Md.	H	30'0"	54.8	1,132,000	–
	J	30'0"	54.5	1,278,000	Idle
	K	30'0"	54.6	1,132,000	Idle
	L	45'0"	130.4	3,398,000	1990
Dofasco					
Hamilton, Ont.	1	20'9"	31.8	910,000	1990
	2	20'9"	32.6	910,000	1988
	3	21'6"	31.9	910,000	1989
	4	28'0"	56.3	1,633,000	1994
Geneva Steel					
Geneva, Utah	1	26'6"	43.7	730,000	1988*
	2	26'6"	43.7	730,000	1988*
	3	26'6"	43.7	730,000	1990*
* Bosh					
Gulf States Steel					
Gadsden, Ala.	1	17'0"	–	–	Idle
	2	26'0"	45.6	900,000	1988*
* Bottom, Bosh and Stack					
Inland Steel					
Indiana Harbor, Ind.	1	20'9"	30.9	438,000	Idle
	2	19'10"	24.7	365,000	Idle
	3	21'6"	–	–	Idle
	4	20'10"	–	–	Idle
	5	26'6"	46.0	839,500	1990
	6	26'6"	46.0	839,500	Present
	7	45'0"	123.9	2,920,000	1987
	A	26'6"	46.1	839,500	1990*
	B	26'6"	46.1	803,000	1990**
* Blown in from complete reline 11/77; Blown in from stack reline 2/83 ** Blown in from stack reline 3/80; Blown in from hearth reline 8/87					
LTV Steel					
Cleveland, Ohio	C-1	27'6"	–	–	1988
	C-2	27'0"	44.9	1,100,000	–
	C-3	30'6"	46.6	1,300,000	Idle
	C-5	29'6"	56.2	1,330,000	1990
	C-6	29'6"	56.2	1,240,000	1989*

...On Size, Production and Plans For Relining

Company and Location	Furnace Number /Name	Hearth Diam. (ft/in.)	Working Volume (Mcf)	Yearly Production (Net Tons)	Reline Date
LTV Steel (cont.)					
Indiana Harbor, Ind.	H-1	27'6"	–	–	–
	H-3	29'6"	56.1	1,460,000	1988
	H-4	32'10"	70.1	1,730,000	1987
* Blown in from bosh and gun stack reline 2/87					
McLouth Steel					
Trenton, Mich.	1	28'6"	56.7	1,000,000	–
National Steel					
Granite City, Ill.	A	27'3"	50.7	876,000	–
	B	27'3"	50.7	949,000	–
Ecorse, Mich.	A	30'6"	62.4	1,500,000	–
	B	29'0"	58.5	1,200,000	–
	D	28'0"	53.3	1,200,000	–
Rouge Steel					
Dearborn, Mich.	A	20'0"	28.1	660,000	–
	B	20'0"	28.1	660,000	–
	C	29'0"	55.0	1,200,000	–
Sharon Steel					
Farrell, Pa.	3	23'1"	32.3	700,000	–
Shenango, Inc.					
Neville Island, Pa.	B	22'9"	29.3	450,000	–
Stelco					
Hamilton, Ont.	C	25'0"	37.7	800,000	Idle
	D	29'0"	52.9	1,000,000	–
	E	32'0"	72.5	1,600,000	–
Lake Erie, Ont	1	34'0"	76.1	1,400,000	1988
Sydney Steel					
Sydney, Nova Scotia	3	21'6"	23.9	550,000	–
USS					
Fairfield, Ala.	8	32'0"	77.5	1,825,000	–
Fairless Hills, Pa.	2	30'10"	58.8	1,000,000	–
	3	30'10"	58.8	1,000,000	–
Gary, Ind.	4	28'0"	53.9	1,058,500	–
	6	28'0"	53.1	1,058,500	–
	7	28'0"	44.4	1,058,500	–
	8	26'6"	45.6	949,000	–
	13	36'6"	101.7	2,737,000	–
Lorain, Ohio	1	23'0"	29.0	525,000	–
	4	29'0"	50.8	1,150,000	–
Weirton Steel					
Weirton, W.Va.	1	27'0"	54.0	1,000,000	1989
	2	27'0"	44.0	800,000	1990
	3	27'0"	46.7	800,000	1988
	4	27'0"	46.7	–	1988
Wheeling-Pittsburgh					
Steubenville, Ohio	1	24'9"	37.2	600,000	1991
	2	23'2"	35.4	–	1995
Mingo Junction, Pa.	3	24'1"	33.7	700,000	1993
	5	23'4"	40.5	700,000	1995

Source: Iron Age and industry reports

said Mr. Duncan. That compared with 5.78 tons in 1982. The coke rate has dropped and the silicon content of the hot metal has decreased.

"We have a very stable operation," said Mr. Duncan. "We have a high percent availability. We run on 40 pct sinter. We feel we have good burden distribution."

Lining wear is checked regularly. "We have core-drilled parts of the bosh and a couple of areas in the stack," said Mr. Duncan. "In the mantle and the stack, our lining thickness is still at the ends of the cooling plates. In the top of the bosh, we have lost anywhere from four to eight in. We have been told that's a pretty normal wear rate."

These findings are in line with Armco's campaign target. "We do not anticipate a major reline until 1992," said Mr. Duncan. "That would be eight years. We hope as we continue to improve maintenance technology – gunning and grouting – it would be beyond that."

Cooling leaks haven't caused major problems. "We've lost a total of about five cooling plates since we started the furnace in October 1984," said Mr. Duncan. "When we detect leaks, we take that plate out and put a new plate in."

He isn't counting on the intense cooling action of the Hoogovens system to prevent oxidation of graphite. "It is our opinion that you can reach temperatures that support the dissociation of water and oxidation. We take precautions. When we detect a leaking plate, water will be taken off that plate immediately."

He feels the new lining system is performing as expected. "We're satisfied with it at this point."

Wheeling-Pittsburgh No. 5

Wheeling-Pittsburgh Steel Corp. began relining its No. 5 blast furnace at Mingo Junction, Ohio, on Aug. 15, 1987. On Dec. 4, 114 days later, the job was completed.

"This was a full reline," said R. C. Stoll, superintendent of blast furnaces at Wheeling-Pittsburgh's Steubenville plant. "In a full re-

line, you take out your hearth and replace it. A partial reline is limited to the bosh and stack."

The $33 million project also included the installation of Bailey Hoogovens refractories in two of the three stoves. Fifty-three ft of furnace shell plate were replaced, and the cooling of refractories was improved through the installation of added cooling plates.

Refractories for the stoves and hot blast mains were supplied by National Refractories. "They ranged from a high-fired superduty to special andalusite-based 60 pct alumina refractory," said L.J. Scheibal, product manager, clay/aluminum refractories, National.

Bailey Hoogovens was the design engineer for the whole project. A Hoogovens hearth was installed, but its graphitic system wasn't used in the bosh or stack.

The stove changes and associated improvements made it possible to raise hot blast temperatures 400°F. "With the higher temperatures, you drive the furnace more," said Mr. Stoll. "We increased the charging capacity of the furnace. If we had not done that, the furnace would have run away from us."

The No. 3 furnace has a hearth diam of 25.6 ft and 16 tuyeres. The furnace is rated for a little over 2,000 tons a day. "We're expecting to accomplish in the area of 2,500 tons a day," said Mr. Stoll. On individual days, No. 3 has actually gone over 2,700 tons.

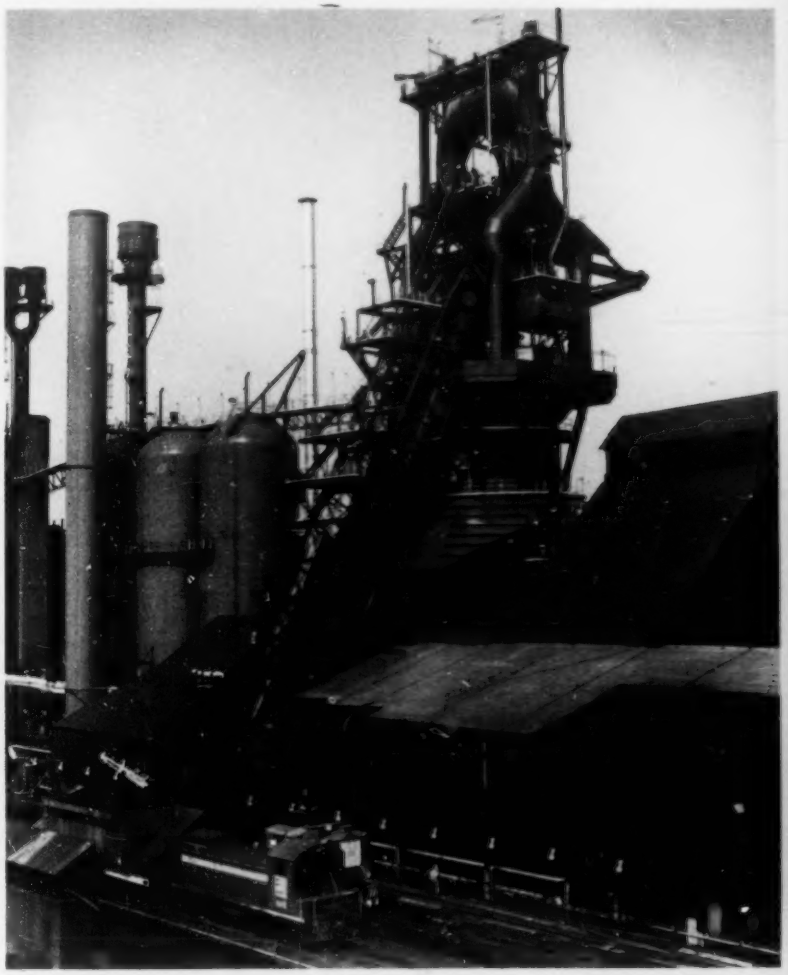
Wheeling-Pittsburgh is in the fortunate position of having an ample coke supply. Like other producers, the company has found that the supply of iron ore pellets has tightened. One supplement to the pellets is being tried.

"We're unloading barges with lump ore from Brazil," said Mr. Stoll in June.

He was confident the rebuilding would yield benefits. "We expect longer campaign life," he said.

Dofasco No. 4

In mid-1986, Dofasco began rebuilding its No. 4 blast furnace. This has a 28 ft hearth and a bell-less top. It's cooling system has included both staves and cooling plates.



LTV Steel's big H-4 furnace at Indiana Harbor was relined and blown in July 1987.

In the rebuilding project, extensive use was made of the graphitic refractories and cooling plates of Hoogovens. Details of the lining were described by R.M. Bean of Dofasco in a paper given at the February 1988, meeting of the Eastern States Blast Furnace and Coke Oven Assn.

"The major part of the furnace refractory is laid dry using machined bricks," said Mr. Bean. "The bosh and lower stack area is constructed of alternating layers of graphite and semi-graphite and semi-graphite, laid dry, with copper cooling plates in each ring.

"Cooling is provided by a dense array of copper cooling plates, each row spaced 12 in. apart, measured vertically. The mid-stack area features the inclusion of silicon carbide at the hot face to increase the wear life of the lining.

"The upper stack features a less dense cooling plate configuration. These plates are spaced 2 to 2½ ft apart vertically.

"The furnace hearth is constructed primarily of graphite and semi-graphite with high alumina and high-fired superduty above the graphite of the hearth bottom. Cooling is provided by external water sprays.

"Our operators are quite happy with the new design," said Mr. Bean in June. "Our figures show that the new design is more efficient in removing heat from the lining."

By George J. McManus

PRICE & PRODUCTION DATA

(Effective July 5, 1988)

Steel production by districts, thousands of tons (000 omitted)

	Last Week	Two Weeks Ago	Month Ago	Year Ago
Northeast Coast	281	273	280	243
Pittsburgh	200	194	204	153
Youngstown	120	93	129	91
Lake Erie	152	139	162	144
Detroit	144	158	160	153
Chicago	446	486	533	489
Midwest	189	176	183	186
Southern	208	206	218	185
Western	94	94	100	51
U.S. Production	1,834	1,819	1,969	1,695

Source: American Iron & Steel Institute

Lake Superior Ore Prices

51.50% Fe Natural delivered lower Lake ports unless otherwise stated. Rail transportation, handling and unloading may be charged to buyer. Coarse ore 80¢ premium.

Pellets (per iron unit natural)	gross-ton 37.344*
Pellets (per iron unit natural)	gross-ton 46.84-59.4**
Pellets (per iron unit natural)	gross-ton 72.45-86.9***
Mesabi, regular-unscreened	gross-ton 32.53
Mesabi, non-bessemer	gross-ton 30.03-31.53

*37.344c—U.S. Steel: 5/20/87. FOB Mount Iron, Minn. **46.84c—Inland Steel Mining: 1/1/87. 58.0c—Mineral Services: 8/13/85. 59.4c—Pickands Mather: 8/1/85, delivered Hall of Vessel, upper Lake ports. ***72.45c—Cleveland Cliffs: 12/30/86. Oglebay Norton: 3/1/87. 86.9c—Hanna Mining: 2/26/82.

STEEL PRODUCTION, COMPOSITE PRICES

(Effective July 5, 1988)

U.S. Steel Production	Last Week	Two Weeks Ago	To Date 1988	To Date 1987
Net tons, in thousands	1,834	1,819	50,923	41,800
Capability Utilization Rate	82.2	84.9	90.3	74.3

Composite Prices	This Week	Week Ago	Month Ago	Year Ago
Finished Steel Base* (¢/lb.—eff. 4/3/88)	24.333	24.333	24.333	25.236
Pig Iron** (Net ton= 2000 lbs.)	$213.00	$213.00	$213.00	$213.00
Scrap No. 1 hvy *** (Gross ton=2240 lbs.)	$ 115.17	$ 105.17	$ 102.83	$ 79.50
No. 2 bundles	$ 76.83	$ 70.50	$ 70.50	$ 54.17

Scrap Comparison (Gross Ton)

No. 1 steel, Pittsburgh	$ 121.50	$ 106.50	$ 104.50	$ 85.50
No. 1 steel, Philadelphia	104.50	101.50	96.50	73.50
No. 1 steel, Chicago	119.50	107.50	107.50	79.50
No. 1 bundles, Detroit	128.50	108.50	108.50	100.50
Low Phos., Youngstown	130.50	115.50	115.50	89.50
No. 1 mach'y cast., Pgh	98.50	98.50	98.50	84.50
No. 1 mach'y cast., Phila	111.50	111.50	111.50	93.50
No. 1 mach'y cast., Chi	128.50	128.50	128.50	103.50

*Finished Steel Composite: Weighted index of steel bars, structurals, plates, rails, hot rolled and cold rolled sheets.

**Pig Iron Composite: Based on average prices for basic and foundry pig iron at representative producing points within the U.S.

***Steel Scrap Composite: Average of No. 1 hvy. melting steel scrap and No. 2 bundles delivered to consumers at Pittsburgh, Philadelphia and Chicago.

NONFERROUS PRICES

(Effective July 5, 1988) Prices obtained in trade based on representative tonnages per gross ton delivered to consumer unless otherwise stated.

Primary Metal Prices

(cents per lb.)	current price	last price	date of change
Aluminum (LME)	109.00	122.00	7/5/88
Copper (C)	107.00	113.00	7/5/88
Lead	36.00	34.00	5/23/88
Magnesium Ingot	153.00	148.00	12/9/85
Nickel (LME)	625.00	657.00	7/5/88
Zinc	66.00	63.00	6/10/88

ALUMINUM: Avg. for last week & previous week. COPPER (C)=cathode. LEAD: common grade. MAGNESIUM: 99.8% pig, delivered. NICKEL: Avg. for last week & previous week. ZINC: high grade.

Antimony, American Laredo, Texas	$2.00
Beryllium-aluminum 5% Be, per lb. contained Be	$260.00
Beryllium-copper strip No. 25, per lb Be	$8.00
Beryllium powder SP200F, per lb	$244.00
Cadmium, ton lots	$1.50
Calcium, ton lots, crown	$3.92
Chromium, 99.5% electro	$4.62
Cobalt, 99%, cathode	$12.50
Gold, per troy oz.	$437.50
Indium, per troy oz.	$9.95
Iridium, per troy oz.	$325.00
Magnesium sticks, 10,000 lbs.	$2.12
Mercury, per 76-lb., f.o.b. N.Y.	$348.00
Molybdenum, lb. tech. moly oxides, 20 lb. MO can	$3.45
Palladium, per troy oz.	$125.00
Platinum, per troy oz.	$557.00
Rhodium, per troy oz.	$1,220.00
Silver ingots, per troy oz.	$6.77
Titanium sponge, melt grade	$4.00
Tungsten powder, hyd red	$9.53-9.85
Vanadium	$6.00
Zirconium sponge	$11.20-17.00

(Per lb. unless otherwise noted)

Straits Tin Price

(U.S. cents per lb. EX-SMELTER, based on daily market in Kuala Lumpur in Malaysian dollars per kilo.)

June 27—321.00 June 30—320.00
June 28—318.00 July 1—320.00
June 29—319.00

Scrap Prices
Brass Mill Scrap

(Cents per lb.; over 20,000 lbs. add 1¢ per lb.)

	Solids	Turnings
Copper	85	80
Yellow brass	73	72
Red brass	67½	63½
Comm. bronze	69½	64½
Mang. bronze	49½	48½
Free cutting rod ends	64½	63½

Custom Smelters Scrap

(Cents per lb., carload lots, del. refinery)

No. 1 copper wire	84
No. 2 copper wire	74
Light copper	68

Ingot Makers Scrap

(Cents per lb., carload lots, del. refinery)

No. 1 copper wire	75
No. 2 copper wire	66
Light copper	59
No. 1 composition	58
No. 1 comp. turnings	58
Hvy. yellow brass solids	42
Hvy. yellow brass turnings	36
Radiators	38

Aluminum		
New mixed clips	65	— 66
Old sheet	54	— 55
Old cast	56	— 57
Clean dry borings	46	— 47

Dealers' Scrap

(Dealers' buying price f.o.b. New York in cents per pound)

Aluminum		
Segregated clippings	57	— 58
Mixed L.C. clips	56	— 57
Old sheets and cast	47	— 48
Borings and turnings	39	— 40
Duraluminum clippings	48	— 49

Copper and Brass		
No. 1 copper wire	70	— 72
No. 2 copper wire	60	— 61
Light copper	54	— 55
Radiators	38	— 39
No. 1 composition	58	— 59
No. 1 composition turnings	54	— 55
Cocks and faucets	48	— 49
Clean heavy yellow brass	44	— 45
Brass pipe	52	— 53
New soft brass clippings	64	— 65

Lead		
Heavy soft lead	14	— 15
Whole batteries	2	— 3
Type metal	22	— 23
Electrotype	14	— 15

Nickel		
Nickel solid	445	—455
Nickel rod ends	438	—448
Nickel sheets, clips	428	—438
Nickel turnings	254	—274

Zinc		
New zinc clippings	19	— 20
Old diecast zinc	15	— 16

EFFECTIVE JULY 5, 1988

(Effective July 5, 1988) Prices obtained in trade based on representative tonnages per gross ton delivered to consumer unless otherwise stated. Prices are the opinions of *Iron Age* editors and correspondents, based on contacts with dealers, brokers, generators and users in the industry on the effective date listed above.

Ferrous Scrap Prices

Pittsburgh

No. 1 hvy. melting	$ 121.00 to	$ 122.00
No. 2 hvy. melting	111.00 to	112.00
No. 1 dealer bundles	151.00 to	152.00
No. 1 factory bundles (auto)	161.00 to	162.00
No. 2 bundles	69.00 to	70.00
No. 1 busheling	151.00 to	152.00
Machine shop turnings	44.00 to	45.00
Shoveling turnings	89.00 to	90.00
Cast iron borings	88.00 to	89.00
Low phos. punchings plate	164.00 to	165.00
Heavy turnings	111.00 to	112.00
No. 1 RR hvy. melting	142.00 to	143.00
Rails, 2 ft. and under	158.00 to	159.00
Scrap rails, random lgth.	146.00 to	147.00
RR specialties	151.00 to	152.00
No. 1 machinery cast	98.00 to	99.00
Cupola cast	90.00 to	91.00
Heavy breakable cast	40.00 to	41.00
Stainless		
18-8 bundles and solids	1,290.00 to	1,300.00
18-8 turnings	1,190.00 to	1,200.00

Chicago

No. 1 hvy. melting	$ 119.00 to	$ 120.00
No. 2 hvy. melting	116.00 to	117.00
No. 1 dealer bundles	133.00 to	134.00
No. 1 factory bundles (auto)	131.00 to	132.00
No. 2 dealer bundles	89.00 to	90.00
No. 1 busheling	140.00 to	141.00
Shredder scrap	140.00 to	141.00
Machine shop turnings	51.00 to	52.00
Mixed borings and turnings	43.00 to	44.00
Shoveling turnings	70.00 to	71.00
Cast iron borings	66.00 to	67.00
Low phos. forge crop	162.00 to	163.00
Low phos. punchings plate 1/4 in. and heavier	178.00 to	179.00
Low phos. 2 ft. and under	171.00 to	172.00
No. 1 RR hvy. melting	134.00 to	135.00
Scrap rails random lgth.	144.00 to	145.00
Rerolls, rails	154.00 to	155.00
Rails, 2 ft. and under	174.00 to	175.00
RR couplers and knuckles	133.00 to	134.00
RR car axles	158.00 to	159.00
No. 1 machinery cast	126.00 to	129.00
Cupola cast	108.00 to	109.00
Stove plate	130.00 to	131.00
Steel car wheels	154.00 to	155.00
Stainless		
18-8 bundles and solids	1,250.00 to	1,260.00
18-8 turnings	1,150.00 to	1,160.00
430 bundles and solids	260.00 to	270.00
430 turnings	175.00 to	185.00

Philadelphia

No. 1 hvy. melting	$ 103.00 to	$ 106.00
No. 2 hvy. melting	93.00 to	96.00
No. 1 dealer bundles	135.00 to	136.00
No. 2 dealer bundles	70.00 to	73.00
No. 1 busheling	135.00 to	138.00
Shredder scrap	130.00 to	133.00
Machine shop turnings	32.00 to	35.00
Mixed borings and turnings	32.00 to	35.00
Shoveling turnings	53.00 to	56.00
Low phos. 5 ft. and under	125.00 to	128.00
Low phos. 2 ft. punchings	142.00 to	145.00
Electric furnace bundles	146.00 to	149.00
RR specialties	124.00 to	127.00
Rails, 2 ft. and under	145.00 to	148.00
Cupola cast	102.00 to	105.00
Heavy breakable cast	52.00 to	55.00
No. 1 machinery cast	110.00 to	113.00

Detroit

Brokers buying prices per gross ton on cars

No. 1 hvy. melting	$ 79.00 to	$ 80.00
No. 2 hvy. melting	77.00 to	78.00
No. 1 dealer bundles	128.00 to	129.00
No. 2 bundles	61.00 to	61.00
No. 1 busheling	126.00 to	127.00
Drop forge flashings	74.00 to	75.00
Machine shop turnings	56.00 to	57.00
Mixed borings and turnings	26.00 to	27.00
Shoveling turnings	56.00 to	57.00
Cast iron borings	62.00 to	63.00
Heavy breakable cast	51.00 to	52.00
Mixed cupola cast	68.00 to	69.00
Automobile cast	90.00 to	91.00
Stainless		
18-8 bundles and solids	1,140.00 to	1,150.00
18-8 turnings	740.00 to	750.00
430 bundles and solids	220.00 to	230.00

Youngstown

Brokers buying prices per gross ton on cars

No. 1 hvy. melting	$ 99.00 to	$ 100.00
No. 2 hvy. melting	90.00 to	91.00
No. 1 dealer bundles	128.00 to	129.00
No. 2 dealer bundles	56.00 to	57.00
Machine shop turnings	50.00 to	51.00
Shoveling turnings	50.00 to	51.00
Low phos. plate	130.00 to	131.00
Electric furnace bundles	130.00 to	131.00
Galvanized bundles	128.00 to	129.00

Cleveland

Brokers buying prices per gross ton on cars

No. 1 hvy. melting	$ 95.00 to	$ 96.00
No. 2 hvy. melting	85.00 to	86.00
No. 1 dealer bundles	130.00 to	131.00
No. 1 factory bundles	131.00 to	132.00
No. 2 bundles	55.00 to	56.00
No. 1 busheling	129.00 to	130.00
Machine shop turnings	53.00 to	54.00
Shoveling turnings	53.00 to	54.00
Cast iron borings	53.00 to	54.00
Cut structural & plates 5 ft. and under	113.00 to	114.00
Cut structural & plates 2 ft. and under	140.00 to	141.00
Low phos. punchings plate	146.00 to	147.00
Foundry steel, 2 ft. & under	90.00 to	91.00
No. 1 RR hvy. melting	108.00 to	109.00
Rails, 2 ft. and under	157.00 to	158.00
Rails, 18 in. and under	161.00 to	162.00
No. 1 machinery cast	89.00 to	90.00
Mixed cast	54.00 to	55.00
Stainless		
18-8 bundles	1,145.00 to	1,155.00
18-8 turnings	745.00 to	755.00
430 bundles	225.00 to	235.00

Buffalo

Brokers buying prices per gross ton on cars

No. 1 hvy. melting	$ 96.00 to	$ 97.00
No. 2 hvy. melting	87.00 to	88.00
No. 1 busheling	125.00 to	126.00
No. 1 dealer bundles	125.00 to	126.00
No. 2 bundles	48.00 to	49.00
Machine shop turnings	30.00 to	31.00
Mixed borings and turnings	30.00 to	31.00
Shoveling turnings	36.00 to	37.00
Cast iron borings	38.00 to	39.00
Low phos. plate	126.00 to	127.00
Structural and plate 2 ft. and under	135.00 to	136.00
Rails, 2 ft. and under	138.00 to	139.00
Scrap rails, random lgth.	119.00 to	120.00
No. 1 machinery cast	104.00 to	105.00
No. 1 cupola cast	87.00 to	88.00

St. Louis

No. 1 hvy. melting	$ 99.00 to	$ 100.00
No. 2 hvy. melting	76.00 to	77.00
No. 1 busheling	140.00 to	141.00
No. 1 dealer bundles	142.00 to	143.00
No. 2 bundles	79.00 to	80.00
Machine shop turnings	46.00 to	47.00
Shoveling turnings	50.00 to	51.00
Cast iron borings	57.00 to	58.00
No. 1 RR hvy. melting	125.00 to	126.00
Rails, random length	121.00 to	122.00
Rails, 5 ft. and under	133.00 to	134.00
Plate and structural, 5 ft. and under	125.00 to	126.00
Cupola cast	89.00 to	90.00
Heavy breakable cast	43.00 to	44.00
Stove plate	125.00 to	126.00
Steel car wheels	122.00 to	123.00
Rerolling rails	130.00 to	131.00
Unstripped motor blocks	66.00 to	67.00

Birmingham

No. 1 hvy. melting	$ 99.00 to	$ 100.00
No. 2 hvy. melting	95.00 to	96.00
No. 1 dealer bundles	108.00 to	109.00
No. 2 bundles	81.00 to	82.00
No. 1 busheling	108.00 to	109.00
Shredder scrap	126.00 to	127.00
Machine shop turnings	41.00 to	42.00
Shoveling turnings	56.00 to	57.00
Cast iron borings	33.00 to	34.00
Electric furnace bundles	89.00 to	90.00
Elec. furnace, 3 ft. & under	104.00 to	105.00
Structural and plate, 2 ft.	140.00 to	141.00
Structural and plate, 4 ft.	128.00 to	129.00
No. 1 RR hvy. melting	128.00 to	129.00
Scrap rails, random lgth.	124.00 to	125.00
Rails, 2 ft. and under	148.00 to	149.00
Angles and splice bars	129.00 to	130.00
No. 1 cupola cast	104.00 to	105.00
Unstripped motor blocks	92.00 to	93.00

Cincinnati

Brokers buying prices per gross ton on cars

No. 1 hvy. melting	$ 97.00 to	$ 98.00
No. 2 hvy. melting	87.00 to	88.00
No. 1 dealer bundles	121.00 to	122.00
No. 2 bundles	61.00 to	62.00
No. 1 busheling	127.00 to	128.00
Machine shop turnings	36.00 to	37.00
Shoveling turnings	45.00 to	46.00
Cast iron borings	48.00 to	49.00
Low phos. 18 in. and under	143.00 to	144.00
Rails, random length	110.00 to	111.00
Rails, 2 ft. and under	143.00 to	144.00
No. 1 cupola cast	92.00 to	93.00
Heavy breakable cast	54.00 to	55.00
Drop broken cast	98.00 to	99.00

New York

Brokers buying prices per gross ton on cars

No. 1 hvy. melting	$ 72.00 to	$ 74.00
No. 2 hvy. melting	64.00 to	65.00
No. 2 dealer bundles	35.00 to	37.00
Mixed borings and turnings	10.00 to	11.00
Shoveling turnings	10.00 to	12.00
Clean cast, chem. borings	38.00 to	39.00
No. 1 machinery cast	81.00 to	82.00
Mixed yard cast	54.00 to	55.00
Heavy breakable cast	18.00 to	20.00
Stainless		
18-8 prepared solids	940.00 to	960.00
18-8 turnings	600.00 to	620.00
430 prepared solids	280.00 to	300.00
430 solids	285.00 to	295.00

Boston

Brokers buying prices per gross ton on cars

No. 1 hvy. melting	$ 73.00 to	$ 75.00
No. 2 hvy. melting	63.00 to	65.00
No. 1 dealer bundles	93.00 to	95.00
No. 2 bundles	33.00 to	35.00
No. 1 busheling	88.00 to	90.00
Shredder scrap	83.00 to	85.00
Machine shop turnings	20.00 to	22.00
Shoveling turnings	25.00 to	27.00
No. 1 machinery cast	85.00 to	87.00
Mixed cupola cast	44.00 to	46.00
Heavy breakable cast	22.00 to	24.00

San Francisco

No. 1 hvy. melting	$ 65.00 to	$ 67.00
No. 2 hvy. melting	59.00 to	61.00
No. 1 dealer bundles	57.00 to	59.00
No. 2 dealer bundles	45.00 to	46.00
Machine shop turnings	17.00 to	18.00
Cast iron borings	17.00 to	18.00
No. 1 cupola cast	89.00 to	91.00

Los Angeles

No. 1 hvy. melting	$ 73.00 to	$ 75.00
No. 2 hvy. melting	67.00 to	69.00
No. 1 dealer bundles	65.00 to	67.00
No. 2 dealer bundles	47.00 to	49.00
Machine shop turnings	17.00 to	18.00
Shoveling turnings	18.00 to	19.00
Cast iron borings	18.00 to	19.00
Elec. furnace, 1 ft. and under (foundry)	80.00 to	82.00
No. 1 cupola cast	84.00 to	86.00

Seattle

No. 1 hvy. melting	$ 94.00 to	$ 95.00
No. 2 hvy. melting	84.00 to	85.00
No. 2 bundles	69.00 to	70.00
No. 1 cupola cast	104.00 to	105.00
Mixed yard cast	85.00 to	87.00

Hamilton, Ont.

Brokers buying prices per net ton on cars

No. 1 hvy. melting	$ 100.00
No. 2 hvy. melting, cut 2 ft. and under	87.00
No. 1 dealer bundles	131.30
No. 2 bundles	81.00
Mixed steel scrap	73.00
Bush. new fact. prep'd.	128.00
Bush. new fact. unprep'd.	104.00
Machine shop turnings	39.00
Short steel turnings	39.00
Mixed borings and turning	26.00
Cast scrap	97.00

Houston

Brokers buying prices per gross ton on cars

No. 1 hvy. melting	$ 110.00 to	$ 111.00
No. 2 hvy. melting	101.00 to	102.00
No. 2 bundles	52.00 to	53.00
Machine shop turnings	45.00 to	46.00
Crushed turnings	55.00 to	56.00
Shredder scrap	114.00 to	115.00
Cut structural plate, 2 ft. and under	126.00 to	127.00
Cut structural plate, 5 ft. and under	117.00 to	118.00
Unstripped motor blocks	60.00 to	61.00
Cupola cast	95.00 to	96.00